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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/521,469	01/18/2005	Hiroyuki Nakamura	12480-000087/US	2269
30593	7590	11/25/2008	EXAMINER	
HARNESS, DICKEY & PIERCE, P.L.C. P.O. BOX 8910 RESTON, VA 20195			RAMDHANIE, BOBBY	
			ART UNIT	PAPER NUMBER
			1797	
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			11/25/2008	PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/521,469	NAKAMURA ET AL.	
	<b>Examiner</b>	<b>Art Unit</b>	
	BOBBY RAMDHANIE	1797	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) Responsive to communication(s) filed on 03 November 2008.  
 2a) This action is FINAL.                    2b) This action is non-final.  
 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) Claim(s) 1-29 is/are pending in the application.  
 4a) Of the above claim(s) 26-29 is/are withdrawn from consideration.  
 5) Claim(s) \_\_\_\_\_ is/are allowed.  
 6) Claim(s) 1-25 is/are rejected.  
 7) Claim(s) \_\_\_\_\_ is/are objected to.  
 8) Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) The specification is objected to by the Examiner.  
 10) The drawing(s) filed on 18 January 2005 is/are: a) accepted or b) objected to by the Examiner.  
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
 a) All    b) Some \* c) None of:  
 1. Certified copies of the priority documents have been received.  
 2. Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)  | Paper No(s)/Mail Date. _____ .                                    |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date <u>1/18/2005, 4/18/2005, 09/18/2008, 11/03/2008</u> . | 5) <input type="checkbox"/> Notice of Informal Patent Application |
|   | 6) <input type="checkbox"/> Other: _____                          |



## **DETAILED ACTION**

### ***Election/Restrictions***

1. Applicant's election with traverse of Claims 1-25 in the reply filed on 09/04/08 is acknowledged. The traversal is on the ground(s) that there would not be a serious search burden on the Examiner. This is not found persuasive because the instant application was filed under 35 U.S.C. 371. Restriction practice under these applications is with regards to unity of invention and lack thereof with respect to the inventions, not whether there is a serious search burden on the Examiner.

The requirement is still deemed proper and is therefore made FINAL.

### ***Claim Rejections - 35 USC § 112***

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claim 4 recites the limitation "the dispersion liquid" in Claim 1. There is insufficient antecedent basis for this limitation in the claim.

### ***Claim Rejections - 35 USC § 102***

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

Art Unit: 1797

4. Claims 1-5, 18-21, & 25 are rejected under 35 U.S.C. 102(a) as being anticipated by Wang et al (Nov. 18, 2002) "Continuous particle self-arrangement in a micro-capillary".

5. Applicants' claims are toward a method and device.

6. Regarding Claims 1-5, 17-21, & 25, Wang et al discloses the method of manufacturing a micro reactor device that includes a tubular reactor as a flow path and allows reaction species to react in the reactor, the method comprising the step of: Forming a particle layer including particles on an inner wall of the reactor (See Experimental Procedure Page 53);

7. Additional Disclosures Included: Claim 2: Wherein the particle layer is formed by causing a dispersion liquid of particles to flow through the reactor and drying the reactor (See Experimental Procedure Page 53); Claim 3: Wherein the particle layer, the particles are aligned regularly (See Results Page 53); Claim 4: Wherein a solvent of the dispersion liquid is a mixed solvent including at least two kinds of solvents (See Experimental Procedure Page 53); Claim 5: Wherein the flow path has a cross section of a round or elliptical shape (See Experimental Procedure Page 53); Claim 17: A micro reactor device, comprising a tubular reactor as a flow path, for allowing reaction species to react in the reactor, the micro reactor device further comprising: A particle layer including particles, provided on an inner wall of the reactor (See Experimental Procedure Page 53); Claim 18: Wherein in the particle layer, the particles are aligned regularly (See Results, Page 53); Claim 19: Wherein the flow path has a diameter between 1 $\mu$ m and 1mm (See Experimental Procedure Page 53); Claim 20: Wherein the

Art Unit: 1797

particles of the particle layer have a diameter between 1nm and 10 $\mu$ m (See Experimental Procedure Page 53); Claim 21: Wherein the particle layer has a thickness of not more than 20 $\mu$ m; and Claim 25: Wherein the particle layer is patterned (See Page 53 Results).

8. Claims 1-3, 5-7, 17-20, 22, & 25 are rejected under 35 U.S.C. 102(a) as being anticipated by Li et al (Apr. 2003).

9. Applicants' claims are toward a method and device.

10. Regarding Claims 1-3, 5-7, 17-20, 22, & 25, Li et al discloses the method of manufacturing a micro reactor device that includes a tubular reactor as a flow path and allows reaction species to react in the reactor, the method comprising the step of: Forming a particle layer including particles on an inner wall of the reactor (See Experiment Page 49);

Additional Disclosures Included: Claim 2: Wherein the particle layer is formed by causing a dispersion liquid of particles to flow through the reactor and drying the reactor (See Experiment); Claim 3: Wherein in the particle layer, the particles are aligned regularly (See Figure 1); Claim 5: Wherein the flow path has a cross section of a round or elliptical shape (See Experiment, capillaries); Claim 6: Wherein the particles are a catalyst (See Experiment; SiO<sub>2</sub>); Claim 7: Wherein a catalyst is supported by the particle layer (See Results and Discussion; TiO<sub>2</sub>-coated SiO<sub>2</sub>); Claim 17: A micro reactor device, comprising a tubular reactor as a flow path, for allowing reaction species to react in the reactor, the micro reactor device further comprising: A particle layer

Art Unit: 1797

including particles, provided on an inner wall of the reactor (See Experiment); Claim 18: Wherein in the particle layer, the particles are aligned regularly (See figure 1); Claim 19: Wherein the flow path has a diameter between 1 $\mu\text{m}$  and 1 mm (See Experiment); Claim 20: Wherein the particles of the particle layer have a diameter between 1 nm and 10  $\mu\text{m}$  (See Experiment, SiO<sub>2</sub> colloid – 120 nm); Claim 22: Wherein the particles are a catalyst (See Experiment, SiO<sub>2</sub> and TiO<sub>2</sub> mat act as catalysts); Claim 25: Wherein-the particle layer is patterned (See Figure 1).

11. Claims 1, 3, 5, 7, 12, 14, 17-22, & 25 rejected under 35 U.S.C. 102(b) as being anticipated by Kenis et al (July 1999).

12. Applicants' claims are toward a method and device.

13. Regarding Claims 1, 3, 5, 7, 12, 14, 17-22, & 25, Kenis et al discloses the method of manufacturing a micro reactor device that includes a tubular reactor as a flow path and allows reaction species to react in the reactor, the method comprising the step of: Forming a particle layer including particles on an inner wall of the reactor (See Page 83 1st Column; First Sentence); Claim 3: Wherein the particle layer, the particles are aligned regularly (See Page 83, Left Column, lines of crystals); Claim 5: Wherein the flow path has a cross section of a round or elliptical shape (see Page 83, Left Column, diameter refers to a circle); Claim 6: Wherein the particles are a catalyst (See Page 83, Left Column, Si/SiO<sub>2</sub>); Claim 7: Wherein a catalyst is supported by the particle layer (See Page 83, Left Column, organic polymer); Claim 12: A hydrophilicity process (See Figure 2A) and a hydrophobicity process (See Figure 2B) are performed on desired

regions of the inner wall of the reactor, and a water dispersion liquid of particles is caused to flow through the reactor (See Figure 2B); Claim 14: Wherein using the particle layer as a mold, a layer is formed by filling spaces between the particles of the particle layer with sol or nanoparticles and solidifying the sol or nanoparticles, and the particles of the particle layer are removed (See Figure 2A & B; etching of the mold using HF and also deposition of the sol solution; 0.0005% aqueous solutions of poly(sodium 4-styrene-sulfonate); Claim 17: A micro reactor device, comprising a tubular reactor as a flow path, for allowing reaction species to react in the reactor, the micro reactor device further comprising: a particle layer including particles, provided on an inner wall of the reactor (See Figure 2B); Claim 18: Wherein the particle layer, the particles are aligned regularly (See Page 83, Left Column, lines of crystals); Claim 19: Wherein the flow path has a diameter between 1 $\mu\text{m}$  and 1 mm (See Page 83, Left Column, capillary diameters 50 to 400  $\mu\text{m}$ ); Claim 20: Wherein the particles of the particle layer have a diameter between 1 nm and 10 $\mu\text{m}$  (See Page 83 Left Column lines of crystals that are < 10 $\mu\text{m}$  wide); Claim 21: Wherein the particle layer has a thickness of not more than 20  $\mu\text{m}$  (See Page 84, Left Column, <20  $\mu\text{m}$  thick); Claim 22: Wherein the particles are a catalyst (See Page 84, Left Column to Middle Column; calcite and apatite); Claim 25: Wherein the particle layer is patterned (See Page 84, Left Column, crystals are patterned).

***Claim Rejections - 35 USC § 103***

14. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

15. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

16. Claims 6-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wang et al.

17. Applicants' claims are toward a method and device.

18. Regarding Claims 6-9, Wang et al discloses the method as set forth in claim 1, except wherein the particles are a catalyst. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the particles to be a catalyst because according to Wang et al, it is possible to design the inner microstructure of a capillary with particle arrangement, which has the potential application to produce catalyst and micro/nano-devices in a capillary (See Introduction Page 53).

Art Unit: 1797

19. Additional Disclosures Included: Claim 7: Wherein a catalyst is supported by the particle layer (See Introduction); Claim 8: Wherein the particle layer includes composite particles formed by supporting a functional material by the particles (See Introduction, a composite particle is formed with the introduction of nano-devices); Claim 9: Wherein in the composite particles, the functional material covers the particles (See Introduction); Claim 10: Wherein the composite particles are formed by a heterocoagulation method (See Experiment); and Claim 11: Wherein the composite particles are formed by controlling a surface charge of the particles by a surface-active agent (See Experiment).

20. Claims 12-16 & 22-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wang et al in view of Li et al.

21. Applicants' claims are toward a method and device.

22. Regarding Claims 12-16 & 22-24, Wang et al discloses the method according to Claim 1 (& device of Claim 17), and a water dispersion liquid of particles is caused to flow through the reactor. Wang et al does not disclose a hydrophilicity process and a hydrophobicity process are performed on desired regions of the inner wall of the reactor. Li et al discloses this feature (See Page 965 Left Column, First Paragraph). It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Wang et al with Li et al because this would allow control of the movement of the solution through capillary as a result of surface tension.

23. Additional Disclosures Included: Claim 13: Wherein the particles are a conductive material, and electrodes are formed by sintering the particles (See Li et al Page 964,

Art Unit: 1797

Right Column, first paragraph); Claim 14: Wherein using the particle layer as a mold, a layer is formed by filling spaces between the particles of the particle layer with sol or nanoparticles and solidifying the sol or nanoparticles, and the particles of the particle layer are removed (See Li et al Page 964, Right Column, first paragraph); Claim 15: Wherein the particles are removed by thermal decomposition (See Li et al Page 964, Right Column, first paragraph); Claim 16: Wherein a catalyst is supported by the layer formed by filling and solidifying the sol or nanoparticles (See Li et al Page 964, Right Column, first paragraph); Claim 22: Wherein the particles are a catalyst (See Wang et al – Silicon, & Li et al; SiO<sub>2</sub> and TiO<sub>2</sub>); Claim 23: Wherein the particles are composite particles supporting a functional material (See Li et al, Figure 1); and Claim 24: Wherein the composite particles are covered particles that are the particles covered with the functional material (See Li et al Page 964, Right Column).

### ***Telephonic Inquiries***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to BOBBY RAMDHANIE whose telephone number is (571)270-3240. The examiner can normally be reached on Mon-Fri 8-5 (Alt Fri off).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Walter Griffin can be reached on 571-272-1447. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/B. R./

/Walter D. Griffin/  
Supervisory Patent Examiner, Art Unit 1797